

# Daily Lifestyle Habits as Risk Factors for Plaque-Induced Gingivitis and Periodontitis Severity and Grading among Samples of Dental Students at King Khalid University

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## Abstract

**Objective:** To assess daily lifestyle habits as risk factors for plaque-induced gingivitis and periodontitis severity and grading among samples of dental students at King Khalid University. **Material and Methods:** This study included 150 male participants. They were divided according to the levels into three equal groups: levels 5, 6, and 7 (group I), levels 8, 9, 10 (group II) and levels 11, 12, and interns (group III). This study consisted of questions related to age, gender, educational level, father's education, mother's education, home ownership, brushing teeth more than or twice a day, in addition to daily lifestyle habits that were daily smoking, daily use of sugary drinks, and daily use of sugary foods. Some clinical parameters of plaque-induced gingivitis and periodontitis and the percentage of radiographic bone loss were recorded. All data were collected and analyzed using Tukey's test and Chi-square test. A P-value of less than 0.5 ( $p < 0.5$ ) was considered a statistically significant difference, and less than 0.001 ( $p < 0.001$ ) was a highly statistically significant difference. **Results:** One hundred fifty male dental students of different levels in the college of dentistry at King Khalid University participated in the study in three groups (I, II, and III). The mean age of group III is more than that of group II and group I, with highly statistically significant differences ( $p < 0.001$ ). There are significant differences in periodontal clinical parameters in the comparison between group I, group II, and group III ( $p < 0.05$ ). The plaque index score (2.1 - 3) and the gingival bleeding index score (>30%) were more among the participants in group I than the participants in groups III and II. There was an increase in the percentage of affected participants with stages III and IV of clinical attachment loss (CAL), periodontal

pocket depth (PPD), radiographic bone loss (%RBL), tooth mobility, as well as glycated hemoglobin (HbA1c) test values (>7%), and the number of cigarettes smoked per day (>10 cigs) in group III more than in group II and I. **Conclusion:** We conclude that the severity and grading of plaque-induced gingivitis were higher among the participants in group I, while the severity and grading of periodontitis were higher among the participants in group III due to the different impact of their daily lifestyle habits.

## Keywords

Daily Lifestyle, Dental Students, King Khalid University, Periodontitis, Plaque-Induced Gingivitis

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## 1. Introduction

Periodontal disease is a group of inflammatory diseases of the surrounding periodontal tissues that have a multifactorial etiology with a dental plaque as the primary factor [1]. They may be more common in developing countries than in developed countries [2] [3], where 10% - 15% of the world's population suffers from the periodontal disease [4].

The incidence of periodontal diseases is associated with health-related risk behavior factors such as carbohydrate-rich diets, alcohol intake, smoking, and inadequate oral hygiene, which are prevalent in developing countries, and other factors, including poor access to healthcare services and low socio-economic status [5] [6]. Thus, the severity and progression of periodontal diseases are influenced by various factors [7].

Some studies have shown that incorrect tooth brushing frequency/technique and frequent sugar intake increase inflammation of periodontal tissue [8] [9] [10]. In contrast, another study reported that periodontal tissue inflammation among individuals with homeownership, higher parental education, and family income or who owned a car was lower [11].

Lifestyle has been described as an individual daily activity including healthy and risky behaviors. Recently, lifestyle is gaining importance in maintaining periodontal health because it reflects the way people live, their attitudes, and their activities that may have a direct or indirect effect on the severity and progression of periodontal disease [12]. Belloc and Breslow's research was the first study that revealed the strong relationship between lifestyle exercise and physical health status [13]. Moreover, another study detected that individuals who have an active lifestyle have good oral hygiene [14].

In Saudi Arabia, there are lifestyle changes that occur, and they have passive effects on public health due to their association with various systemic and oral diseases such as increased sweetened beverages and consumption of fruit juices as well as increased smoking and irregular tooth-brushing among young Saudi people [15] [16] [17].

The relationship between the severity and progression of periodontal diseases

and daily lifestyle habits in the population should be assessed through practical diagnostic methods to promote periodontal health. Public health organizations rely on community oral health promotion programs to detect periodontal diseases early in younger age groups to prevent the progression and severity of periodontal diseases. Therefore, the aim of this cross-sectional study was to evaluate daily lifestyle habits as risk factors for plaque-induced gingivitis and periodontitis severity and grading among samples of dental students at King Khalid University.

## **2. Material and Methods**

### **2.1. Study Samples and Design**

One hundred and fifty male participants in this cross-sectional study were counted as the minimum sample size. They have been selected from a list of students from the college of dentistry at King Khalid University, Saudi Arabia, from October 2021 to January 2022. They were divided into three equal groups from levels 5 to 12 and interns (20 - 27 years old). Group I (50 participants from levels 5, 6, and 7), group II (50 participants from levels 8, 9, and 10), and group III (50 participants from levels 11, 12, and interns).

### **2.2. Ethical Considerations**

This study was performed with the understanding and consent of the participants and in compliance with the ethical standards of the Declaration of Helsinki of the World Medical Association. This study was approved by the Institutional Review Board (IRB) of the college of dentistry at King Khalid University. Informed consent was obtained from participants before the start of the study.

### **2.3. Inclusion Criteria**

Inclusion criteria include: 1) Participants with periodontal diseases, 2) Participants with at least 20 remaining teeth in a minimum of four sites in the oral cavity with bleeding on probing (BOP), probing pocket depths (PPD) more than 3 mm, and clinical attachment loss (CAL) more than 1 mm [18], 3) Patients who did not receive periodontal treatment during the 6 months before the start of this study [19].

### **2.4. Exclusion Criteria**

Exclusion criteria include: 1) Students of the other King Khalid University colleges, 2) Levels 1, 2, 3, and 4 for students of the college of dentistry, King Khalid University, 3) Participants who did not answer the lifestyle questions or refused the clinical examination, 4) Students who suffer from any local or systemic diseases that can affect the periodontal tissues, 5) Students who did not provide informed consent.

### **2.5. Participants' Interview**

Participants were interviewed to assess their attitudes toward oral and peri-

odontal health. A self-administered, close-ended, and structured questionnaire was used to collect the personal data (age, father's education, mother's education, homeownership, daily brushing teeth, smoking status, and medical status) of the participants.

## 2.6. Clinical Examination

A periodontal examination was performed for each participant and recorded on a periodontal chart. This clinical examination included **plaque index (PLI)** [20], gingival bleeding index (GBI) [21], probing pocket depth (PD) [22], clinical attachment level (CAL) [23], and tooth mobility (present or absent).

## 2.7. Glycated Hemoglobin (HbA1c) Levels

Participants' medical reports were used to record glycated hemoglobin (HbA1c) levels. The National Glycohemoglobin Standardization Program (NGSP) system was applied in the assessment of HbA1c levels [24].

## 2.8. Radiographic Examination

The percentage of radiographic bone loss was obtained from extra-oral digital panoramic radiographs (GendexOrthoralix 9200 DDE, Georgia-USA) according to the severity of alveolar bone assessed by the American Academy of Periodontology (AAP) as mild (<15%), moderate (15% - 33%), and severe (>33%) [25].

## 2.9. Statistical Analysis

Statistical analysis was performed with the ANOVA test. Data analysis included descriptive statistics on the age of the participants. A Tukey's test was used to evaluate the comparison between group II & group III, group I & group III, and group I & group II. A Chi-square test was performed on the periodontal parameters and lifestyle habits in group I, II and III comparison and the P-value calculation. The P-value was considered as a statistically significant difference of less than 0.5 ( $p < 0.05$ ) and a highly statistically significant difference of more than 0.001 ( $p < 0.001$ ).

## 3. Results

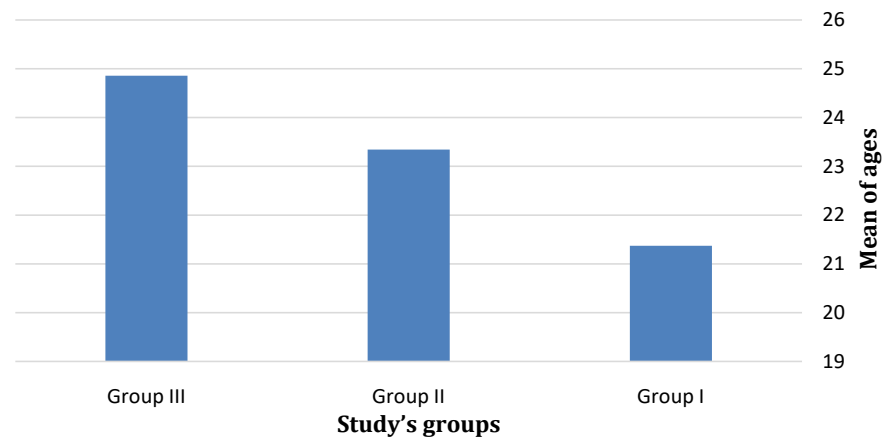
The study was conducted on 150 dental students of different levels within three equal groups ( $n = 50$ ), groups I, II, and III (response rate = 100%). The ages of groups I, II, and III ranged from 20 - 23 years with a mean (standard deviation) of 21.43 (0.88) years, 22 - 25 years with a mean (standard deviation) of 23.01 (1.68) years, and 23 - 27 years with a mean (standard deviation) of 25.79 (6.84) years, respectively (**Table 1** & **Figure 1**).

**Table 1** and **Figure 1** also showed no significant relationship between the ages of the participants. There was a highly significant difference in the comparison between group II & Group III, and group I & group III as well as group I & group II ( $p < 0.001$ ).

**Table 1.** The mean and standard deviation ( $\pm$ SD) of the participants age groups.

Groups	Age of the patient		ANOVA	
	Mean $\pm$ SD	Range	F	P-value
GI	21.43 $\pm$ 0.88	20 - 23	129.31	1.07
GII	23.01 $\pm$ 1.68	22 - 25		
GIII	25.79 $\pm$ 6.84	23 - 27		
Tukey's test				
Group II & Group III		Group I & Group III	Group I & Group II	
<0.001**		<0.001**	<0.001**	

GI: Group I, GII: Group II, GIII: Group III, \*\*: Highly significant differences.

**Figure 1.** Mean of the participants ages groups.

The distribution of study participants according to their lifestyle characteristics is summarized in **Table 2** and **Figure 2**. Most of the participants in group I had fathers with university education (52%) brushed their teeth  $\geq 2$  times daily (58%) and daily used sugary drinks (78.%) more than in groups II and III, whereas the participants in group II had more university-educated mothers (38%) and home ownership than groups I and III. Moreover, the participants in group III currently smoke more daily (34%) than the participants in groups I and II. **Table 2** showed significant differences in lifestyle characteristics during the comparison between groups I, II, and III ( $p < 0.05$ ).

**Table 3** and **Figure 3** shows that more than half of the participants in group I had a high average plaque index (56%) and a gingival bleeding index at  $\geq 30\%$  of the probing sites (54%). This table showed statistically significant differences in plaque index and gingival bleeding index during the comparison between groups I, II and III ( $p < 0.05$ ).

**Table 4** and **Figure 4** show the distribution of participants according to the values of periodontal pocket depth and clinical attachment loss. The values of clinical attachment loss and periodontal pocket depth were more among group III participants than in groups I and II. Clinical attachment loss was 3 - 4 mm in 36% of participants and  $\geq 5$  mm in 12% of participants, while periodontal pocket

**Table 2.** Distribution of study participants according to lifestyle characteristics.

		Groups			Total N (%)	Chi-square	
		I N = 50	II N = 50	III N = 50		X <sup>2</sup>	P-value
Father's education	UE	26 (52.00%)	13 (26.00%)	17 (34.00%)	56 (37.34%)	6.14	0.063*
	LUE	22 (44.00%)	32 (64.00%)	30 (60.00%)	84 (56.00%)		
	NE	2 (4.00%)	5 (10.00%)	3 (6.00%)	10 (6.66%)		
Mother's education	UE	18 (36.00%)	19 (38.00%)	11 (22.00%)	48 (32.00%)	22.18	p < 0.01*
	LUE	28 (56.00%)	22 (44.00%)	31 (62.00%)	81 (54.00%)		
	NE	4 (8.00%)	9 (18.00%)	8 (16.00%)	21 (14.00%)		
Home Ownership	Rented	28 (56.00%)	23 (46.00%)	35 (70.00%)	86 (57.34%)	7.81	0.033*
	Owner	22 (44.00%)	27 (54.00%)	15 (30.00%)	64 (42.66%)		
Brushing teeth ≥ 2 times daily	≥2 Ts/D	29 (58.00%)	26 (52.00%)	13 (26.00%)	67 (44.66%)	13.88	p < 0.01*
	<2 Ts/D	21 (42.00%)	24 (48.00%)	37 (74.00%)	83 (53.34%)		
Currently smoking on a daily basis	D	11 (22%)	15 (30%)	17 (34%)	43 (28.7%)	3.88	p < 0.01*
	ND	39 (78%)	35 (70%)	33 (66%)	107 (71.3%)		
Daily use of sugary drinks	D	39 (78%)	36 (72%)	37 (74%)	112 (74.66%)	0.7866	p < 0.01*
	ND	11 (22%)	14 (28%)	13 (26%)	38 (25.34%)		

UE: University educated, LUE: Less than university educated, NE: Not educated, Ts/D: Times daily, D: Daily, ND: Not daily. \*: Significant differences.

**Table 3.** Distribution of participants according to the average of plaque index and gingival bleeding index.

		Groups			Chi-square	
		I	II	III	X <sup>2</sup>	P-value
PI	0.1 - 1	10 (20%)	27 (54%)	17 (34%)	16.11	0.008*
	1.1 - 2	12 (24%)	8 (16%)	13 (26%)		
	2.1 - 3	28 (56%)	15 (30%)	20 (40%)		
GBI	< 10%	13 (26%)	10 (20%)	15 (30%)	6.81	0.0035*
	10-30%	10 (20%)	15 (30%)	16 (32%)		
	>30%	27 (54%)	25 (50%)	19 (38%)		

GI: Group I, GII: Group II, GIII: Group III, PL: Plaque index, GBI: Gingival bleeding index.

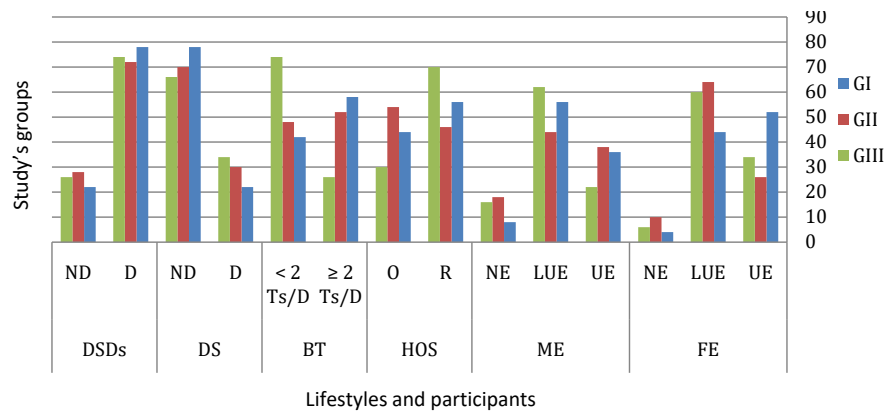
depth was ≤5 mm and >5 mm in 10% of participants. There were significant differences in the comparison between the groups of participants depending on the values of clinical attachment loss and periodontal pocket depth (p < 0.05).

**Table 5, Table 6 and Figure 5, Figure 6** show the distribution of participants according to the values of some parameters of periodontitis complexity and clinical findings of periodontitis modalities, which assessed the severity and progression

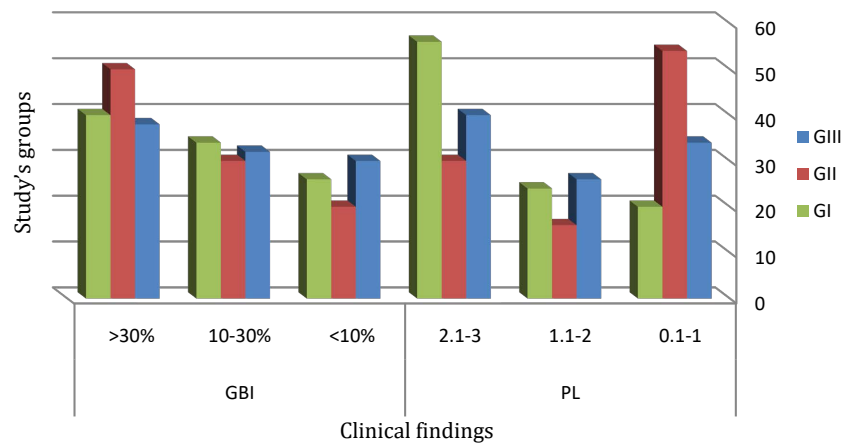
**Table 4.** Distribution of participants according to the values of periodontal pocket depth and clinical attachment loss.

		Groups			Chi-square	
		I	II	III	X <sup>2</sup>	P-value
CAL	1 - 2 mm	41 (82%)	38 (76%)	26 (52%)	8.89	0.01
	3 - 4 mm	9 (18%)	10 (20%)	18 (36%)		
	≥5 mm	0 (0%)	2 (4%)	6 (12%)		
PPD	≤4 mm	48 (96%)	46 (92%)	40 (80%)	8.14	0.02
	≤5 mm	2 (4%)	3 (6%)	5 (10%)		
	>5 mm	0 (0%)	1 (2%)	5 (10%)		

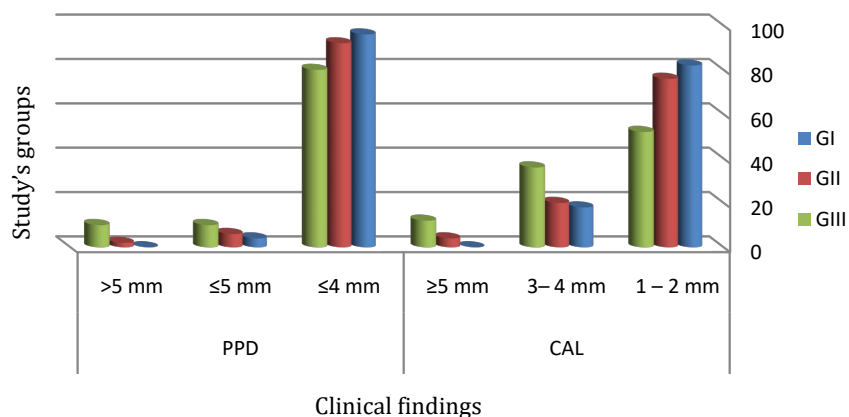
CAL: Clinical attachment loss, PPD: Periodontal pocket depth.



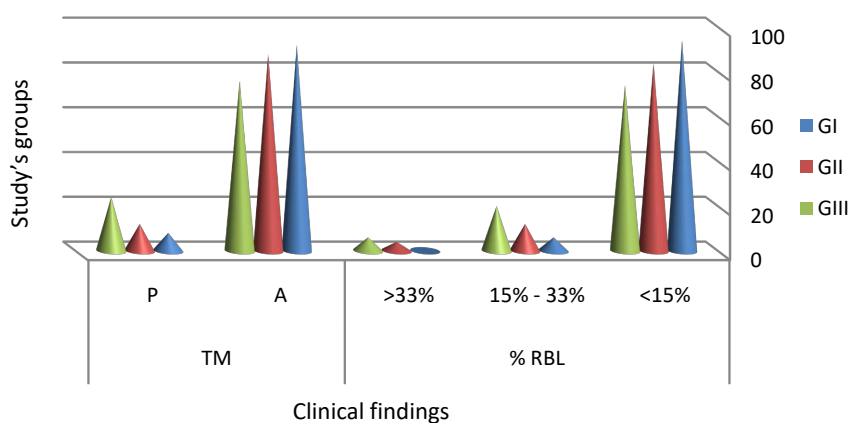
**Figure 2.** Participants' distributions according to lifestyle characteristics. GI: Group I, GII: Group II, GIII: Group III, FE: Father's education, ME: Mother's education, UE: University educated, LUE: Less than university educated, NE: Not educated HOS: Home Ownership, O: Owner, R: Rented, DS: Brushing teeth ≥ 2 times daily, Ts/D: Times daily, D: Daily, ND: Not daily, D: Daily, ND: No-daily, DS: Currently smoking on a daily basis, DSDs: Daily use of sugary drinks.



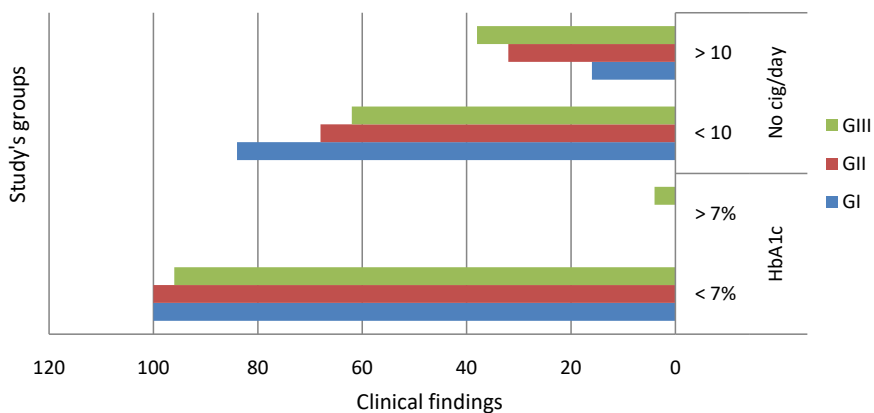
**Figure 3.** Participants' distribution according to plaque index and gingival bleeding index. GI: Group I, GII: Group II, GIII: Group III, PL: Plaque index, GBI: Gingival bleeding index.



**Figure 4.** Participants' distribution according to the values of clinical attachment loss and periodontal pocket depth. GI: Group I, GII: Group II, GIII: Group III.



**Figure 5.** Participants' distribution according to the values of some parameters of Periodontitis Complexity. % RBL: Percentage of radiographic bone loss, TM: Tooth mobility.



**Figure 6.** Distribution of study participants according to values of periodontitis modalities. HbA1c: glycated hemoglobin test; No cig/day: number of cigarettes smoked per day.

of periodontitis among the participants' groups in this study. In group III, the percentage of radiographic bone loss was 15% - 33% in 20% of the participants and >33% in 6% of the participants, and values of glycated hemoglobin test were



**Table 5.** Distribution of study participants according to the values of some parameters of Periodontitis Complexity.

		Groups			Chi-square	
		I N = 50	II N = 50	III N = 50	X <sup>2</sup>	P-value
% RBL	<15%	47 (94%)	42 (84%)	37 (74%)	13.43	<0.051*
	15% - 33%	3 (6%)	6 (12%)	10 (20%)		
	>33%	0 (0%)	2 (4%)	3 (6%)		
Tooth mobility	Absent	46 (92%)	44 (88%)	38 (76%)	9.82	0.063*
	Present	4 (8%)	6 (12%)	12 (24%)		

% RBL: Percentage of radiographic bone loss.

**Table 6.** Distribution of study participants according to values of periodontitis modalities.

		Groups			Total N (%)	Chi-square	
		I N = 50	II N = 50	III N = 50		X <sup>2</sup>	P-value
HbA1c test	<7% HbA1c	50 (100%)	50 (100%)	48 (96%)	148 (98.6%)	13.43	<0.001*
	>7% HbA1c	0 (0%)	0 (0%)	2 (4%)	2 (1.4%)		
No cig/day	<10 cig	42 (84%)	34 (68%)	31 (62%)	107 (71.33%)	9.82	0.063*
	>10 cig	8 (16%)	16 (32%)	19 (38%)	43 (28.66%)		

HbA1c: glycated hemoglobin test; No cig/day: number of cigarettes smoked per day.

>7% in 4% of the participants, as well as the number of cigarettes smoked per day, was >10 cigarettes in 39% of the participants. The parameters of periodontitis complexity and clinical findings of periodontitis modalities in the current study were higher in group III, with significant differences during the comparison between groups I, II, and III ( $p < 0.05$ ).

#### 4. Discussion

Lifestyle habits are associated with periodontal diseases, and their risk factors may affect the condition of oral mucosa and periodontal tissues. Moreover, different lifestyle habits and cultures vary according to the regions in the world [26]. This cross-sectional study included 150 students selected from the college of dentistry, King Khalid University. As far as we know, there is no published study regarding the influence of lifestyle habits as risk factors on some clinical parameters of plaque-induced gingivitis and periodontitis severity and grading among samples of dental students of different levels at King Khalid University. In this study, it was detected that increasing age was significantly associated with periodontitis more than plaque-induced gingivitis, as the severity and grading of periodontitis among the participants in group III were more than in groups I

and II, which is consistent with other previous studies [27] [28] [29]. However, the severity and grading of periodontitis are considered to be cumulative destruction throughout the lifespan, not due to increasing age which is insignificant when good oral hygiene is present. Moreover, the impairment of tissue integrity and the immune system increases the susceptibility of periodontal tissues to diseases [30]. Thus, the severity of periodontal disease changes among individuals according to various factors through their interaction with parents and society and may have a direct or indirect effect on the grading of periodontal diseases [12] [31]. This result is consistent with the clinical findings of our study, where we found that the less periodontal destruction among the participants in group I and group II compared to the participants in group III may be due to the higher parental education levels of the participants in group I and group II and the risky behaviors of the participants in group III.

On the other hand, previous studies revealed that lower educational levels and poor behavioral practices are risk factors for periodontal diseases, and people with higher income and higher education are less affected by severe periodontal diseases [32] [33]. These results are consistent with the results of the current study, where we found that brushing teeth was less than two times a day among the participants of group III compared to group I and group II, and it is also consistent with another study that revealed that more than 95% of participants with good oral hygiene did not have periodontitis [34].

This study revealed that male dental students in group I consumed sugary drinks daily (78%) more than groups III and II, which led to modifying the effect of their current daily smoking and increased gingivitis severity. These clinical findings influence oral health instruction for young adults of this age. Thus, lifestyle habits should be evaluated to solve health problems that have combined causes [35].

Plaque accumulation, oral hygiene, and gingivitis among group I in this study were heavy, with poor oral hygiene, and severe gingivitis consistent with the clinical findings of another Saudi study [36].

Brushing teeth  $\geq 2$  times daily for participants in group III of this study (44.66%) is consistent with the clinical findings of another Brazilian study (41%) [37].

In this study, PLI, GBI, PPD, CAL, %RBL and TM were significantly associated participants' lifestyle habits. Lower parental education, rented home living, brushing teeth less than twice a day, daily smoking, and daily use of sugary drinks were significantly related to greater severity and grading of periodontitis among participants in group III more than participants in groups I and II. Where most of the participants in the present study had generalized severe grade 3 plaque-induced gingivitis (group I and II more than III) and generalized periodontitis stage IV grade C (group III more than I and II). The clinical findings in this study revealed that education of the father and mother, having home ownership of living, non-smoking daily and non-daily use of sugary drinks, and brushing teeth reduced the possibility of progression periodontitis and twice or

more daily tooth brushing significantly more effectively than brushing less than twice daily.

These clinical findings are consistent with those of two previous studies conducted in Korea and Saudi Arabia [38] [39]. Concerning daily smoking, 28.7% of the participants in group III reported that they are smoking daily, which is the cause of the increased severity and progression of gingivitis and periodontitis. These results are consistent with another Saudi study that reported that 20% of participants with severe periodontal diseases were daily smokers and not consistent with another Sweden study that revealed that the severity of periodontal diseases among non-smokers and smokers was similar [40] [41]. Moreover, the clinical finding of this study is consistent with those of other studies, which reported that smokers had more gingival bleeding and severe periodontal diseases than non-smokers [42] [43].

## 5. Strength and Limitations

Participants in this study were selected from male students in the college of dentistry. Thus, it cannot be an accurate representative sample of the influence of lifestyle habits on the severity and progression of periodontal diseases among the Saudi population. Therefore, participants were selected from different cities in Saudi Arabia to increase generalizability. At the end of this study, to more accurately assess the impact of lifestyle habits on the severity and progression of periodontal diseases among dental students, it is recommended that future studies rely on the longitudinal relationship between lifestyle and severity and progression of periodontal diseases.

## 6. Conclusion

Within the limits of the current study, we concluded that the severity and grading of plaque-induced gingivitis were more among the dental students of low levels (groups I and II), while the severity and grading of periodontitis were more among the dental students of high levels (group III) due to the impact of lifestyle among the participants of group III particularly irregular tooth brushing, daily smoking, and daily use of sugary drinks.

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## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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